## AMENDMENT TO THE CLAIMS

1. (Currently Amended) A method of obtaining a frequency error estimate of the difference between a reference frequency and the frequency of a space time transmit diversity signal from first and second received sequences of symbols, transmitted respectively by first and second antennae, where each sequence has two sets of first and second intervals, such that the contents of the second interval of the second received sequence are the additive inverse of the contents of the first interval of the second received sequence, the method comprising the steps of:

receiving the first and second sequences of symbols;

calculating two sets of first and second partial sums as the sum of the contents of the first and second intervals, respectively, for each set;

calculating total sum functions for the first and second sets by summing the first and second partial sums for each set;

calculating ~~a correlation~~ an auto-correlation function based on the total sum functions for the first and second sets; and

extracting the frequency error estimate from the auto-correlation function.

2. (Currently Amended) The method of claim 1, wherein the auto-correlation function is calculated as a time average of the product of the first total sum function and the conjugate of the second total sum function.

3. (Original) The method of claim 1, wherein the received symbols are represented by complex numbers.

4. (Currently Amended) The method of claim 3, wherein the step of extracting includes isolating the imaginary part of the auto-correlation function as the frequency error estimate.

5. (Original) The method of claim 1, wherein the first and second interval in each set are adjacent.

6. (Original) The method of claim 1, wherein the first and second sets of intervals are interleaved with each other.

7. (Original) The method of claim 1, wherein the contents of the first and second intervals in each set form a complete symbol.

8. (Original) The method of claim 1, wherein the contents of the first and second intervals in each set form a half symbol.

9. (Original) The method of claim 1, wherein prior to the step of calculating the total sum functions the second partial sum for each set is multiplied by –1.

10. (Currently Amended) The method of claim 1, wherein the step of extracting includes adding the auto-correlation to a correlation of a second set of total sum functions calculated by summing the first partial sum with the additive inverse of the second partial sum.

11. (Original) The method of claim 1, further comprising the step of multiplying the frequency error estimate by the average of a signal-to-noise-ratio of the received sequences.

12. (Original) The method of claim 1, further comprising the step of altering the reference frequency based on the frequency error estimate to minimze the difference between the reference frequency and the frequency of the space time transmit diversity signal.

13. (Previously Presented) The method of claim 1, further comprising the steps of:

carrying out the receiving step and the three calculating steps in parallel to provide a multitude of diverse correlation functions; and

combining the multitude of diverse correlation functions to provide the correlation function before extracting the frequency error from the correlation function.

14. (Original) An apparatus having a frequency discriminator for obtaining a frequency error estimate of the difference between a reference frequency and the frequency of a space time transmit diversity signal from first and second received sequences transmitted respectively by first and second antennae, and received by a receiving antenna, where each sequence has two sets of first and second intervals, of equal length, such that the contents of the second interval of the second received sequence are the additive inverse of the contents of the first interval of the second received sequence, the frequency discriminator comprising:

a memory, operatively attached to the receiving antenna for storing the contents of the first and second sequences;

interval defining means, operatively attached to the memory to receive the first and second sequences of symbols, for dividing the received sequences into sets of first and second intervals;

partial sum adding means, operatively attached to the interval defining means to receive the contents of first and second sequences during the two sets of first and second intervals, for calculating two sets of first and second partial sums as the sum of the contents of the first and second intervals respectively for each set;

total sum adding means, operatively attached to the partial sum adding means to receive the two sets of first and second partial sums, the total sum adding means for calculating total sum functions for the first and second sets representing the sum of the first and second partial sums for each set;

conjugation means, operatively attached to the total sum adding means to receive the total sum of the second set of partial sums, for calculating the conjugate of the received total sum;

multiplier means, operatively attached to the conjugation means and total sum adding means to receive the total sums for multiplying the received total sums thereby providing a correlation function; and

a frequency error estimator, operatively attached to the multiplier means to receive the correlation function, for extracting the frequency error from the correlation function.

15. (Original) The apparatus of claim 14, further comprising scaling means, operatively attached to the total sum adding means to receive the total sum of the first set of partial sums and to the conjugation means to receive the conjugate of the total sum of the second set of partial sums, for scaling the received total sums.

16. (Original) The apparatus of claim 14, further comprising multiple frequency discriminators sharing a single frequency estimator, and diversity combining means, operatively attached to the multiplier means of each frequency discriminator to receive the multiplied total sums, for combining the received multiplied total sums to provide a diverse correlation function used as the correlation function by the single shared frequency error estimator.

17. (Original) The apparatus of claim 14, further comprising scaling means, operatively attached to the multiplier means to receive the output of the multiplier means, for scaling the correlation function.

18. (Original) The apparatus of claim 14, wherein the interval defining means is a set of samplers.

19. (Original) The apparatus of claim 14, further comprising a selective sampler connecting the partial sum adding means and the total sum adding means for selectively providing the total sum adding means with the partial sum adding means.

20. (Original) The apparatus of claim 14, wherein the scaling means includes means for dividing each total sum by its magnitude.

21. (Original) The apparatus of claim 14, wherein the scaling means includes an ideal scaler.

22. (Original) The apparatus of claim 14, wherein the scaling means includes a signal to noise ratio scaler.

23. (Original) The apparatus of claim 14, further comprising a second scaling means, connecting the multiplier means to the diversity combining means, to receive the multiplied total sums, for scaling the received multiplied total sums, and providing the scaled multiplied total sums to the diversity combining means.

24. (Original) The apparatus of claim 14, wherein the frequency error estimator includes a splitter for separating the real and imaginary component of the correlation function for providing the imaginary component of the correlation function as the frequency error.

25. (Original) The apparatus of claim 14, wherein the interval defining means includes means for providing the partial sum adding means with symbols from adjacent first and second intervals in the same set.

26. (Original) The apparatus of claim 14, wherein the interval defining means includes means for providing the partial sum adding means with symbols from interleaved sets of first and second intervals.

27. (Original) The apparatus of claim 14, wherein the interval defining means includes means for providing intervals one symbol in length.

28. (Original) The apparatus of claim 14, wherein the interval defining means includes means for providing intervals that are a half symbol in length.

29. (Original) The apparatus of claim 14, further comprising a negator, connecting the partial sum adding means to the total sum adding means, for receiving the second partial sum of each set from the partial sum adding means, multiplying the second partial sum of each set by –1, and for providing the negated second partial sum to the total sum adding means.

30. (Original) The apparatus of claim 14, further comprising:

a negator, connecting the partial sum adding means to a second total sum adding means, for receiving the second partial sum of each set from the partial sum adding means, for negating the second partial sum of each set by multiplying the second partial sum by –1; and

a second total sum adding means, operatively attached to the partial sum adding means to receive the first partial sum of each set and to the negator for receiving the negated second partial sum for each set, for calculating second total sum functions for the first and second sets representing the sum of the first partial sum and the negated second partial sum of each set, and for providing the conjugation means with the second total sum of the second set for conjugation.

31. (Original) The apparatus of claim 30, wherein the frequency error estimator is operatively connected to the diversity combining means to receive two correlation functions corresponding to the output of the first and second total sum adding means, for providing the sum of the two correlation functions as the frequency error.

32. (Original) The apparatus of claim 14, further comprising:

a loop filter, operatively attached to the frequency discriminator to receive the frequency error, for generating an oscillator control signal based on the frequency error to minimize the difference between the reference frequency and the frequency of the space time transmit diversity signal; and

a controlled oscillator, operatively attached to the loop filter to receive the oscillator control signal, for generating the reference frequency based on the oscillator control signal.

33. (Original) The apparatus of claim 32, wherein the controlled oscillator is a numerically controlled oscillator.

34. (Original) The apparatus of claim 32, wherein the controlled oscillator is a voltage-controlled oscillator.

35. (New) The method of claim 1, wherein the frequency error is a carrier frequency error and the reference frequency is a receiver reference frequency.